

## Patent Claims

1. A connector seal device for a branch pipe in combination with a transverse opening (2), as can be found in the pierced wall of a main pipeline (1), a shaft, or the like, for which the diameter can fluctuate considerably, wherein this connector seal device comprises the following features:

- a) A hollow-plug type elastomer insert (10), composed in part of relatively soft material, comprises a flexible support collar (12) and a sealing wall region (11) with a tapered inside surface (14) and an outside surface (13), which is generally adapted to the transverse opening (2);
- b) A pipe union (20) of a relatively harder material is provided with an engagement end (21), with a tapered outside surface (23) that can cooperate with the inside surface (14) of the elastomer insert (10), and a socket end (22) which cooperates with the branch pipe;
- c) The inside surface (14) of the elastomer insert (10) and the outside surface (23) of the pipe union (20) are tapered in the insertion direction (IN) for inserting the parts (10, 20) into the transverse opening (2) and/or the direction they are inserted into each other;

**characterized in that**

- d) The sealing wall region (11) with the tapered inside surface (14) is provided with locking ring zones (16) which are inclined in insertion direction (IN) and toward the inside of the hollow space in the elastomer insert, and

- e) The tapered outside surface (23) of the engagement end (21) is also provided with locking ring zones (26) which are inclined toward the outside, counter to the insertion direction (IN), as seen from the engagement end (21);
- f) Wherein during the fitting of the elastomer insert (10) into the transverse opening (2) and the following assembly of the pipe union (20) and the elastomer insert (10), the locking ring zones (16, 26) engage in the manner of ratchet teeth and snap into ring-shaped grooves (16c, 26c) and wherein the elastomer insert (10) is expanded step-by-step and pressed further against the transverse opening (2) through the continued displacement of the pipe union (20) in insertion direction (IN).

2. The connector seal device as defined in claim 1, characterized in that the locking ring zones (16, 26) form a toothing with saw-tooth type cross section and, as compared to the feature of the sealing wall region (11), are composed of a relatively harder material.

3. The connector seal device as defined in claim 1 or 2, characterized in that the locking ring zones (16, 26) are provided with a sliding agent.

4. The connector seal device as defined in one of the claims 1 to 3, characterized in that the taper selected for the inside surface (14) of the elastomer insert is sufficient to form an end stop or assembly stop for the insertion of the pipe union (20).

5. The connector seal device as defined in one of the claims 1 to 4, characterized in that the basic surfaces of the elastomer insert (10) and the pipe union (20) for a connector seal device that is already assembled or which must be assembled are arranged substantially concentric, wherein guide surfaces (15) on the elastomer insert effectively cooperate with guide surfaces (25) on the pipe union.

6. The connector seal device as defined in one of the claims 1 to 5, characterized in that the outside surface (13) of the elastomer insert (10) is cylindrical or is slightly tapered in insertion direction (IN) and is provided with barb-shaped projections (19), which fit against the transverse opening (2) during the installation in insertion direction, but which block any movement counter to the insertion direction.

7. The connector seal device as defined in one of the claims 1 to 6, characterized in that the sealing wall region (11) of the elastomer insert (10) is embodied as a tubular section with sufficient length to cover the reinforced areas (8) which may have been cut during the insertion of the transverse opening (2).

8. The connector seal device as defined in claim 7, characterized in that the outside surface (13) of the elastomer insert (10) is coated with an anti-corrosion agent and/or an adhesive, which is protected by a cover foil during the storage and transport, until just prior to the installation.

9. The connector seal device as defined in one of the claims 1 to 8, characterized in that the sealing wall region (11) of the elastomer insert (10) comprises one or several cavities filled with a sealing agent, wherein these cavities open up under pressure resulting from the installation of the pipe union (20) and release the sealing agent, thereby causing a secondary sealing effect.

10. The connector seal device as defined in one of the claims 1 to 9, characterized in that the support collar (12) of the elastomer insert (10) is composed of a harder material than the sealing wall region (11).

11. The connector seal device as defined in one of the claims 1 to 10, characterized in that the support collar (12) of the elastomer insert (10) is adapted to the diameter of the main pipe (1) and that the support collar (12) is intended for the transverse opening (2) in this main pipe.

12. The connector seal device as defined in one of the claims 1 to 11, characterized in that a second hollow-plug type elastomer insert (30) is provided, which is in part composed of a relatively soft material and is inserted from the inside (4) of the main pipe (1) into the transverse opening (2), along with a hollow press-on cone (40) with locking ring zones corresponding to those on the pipe union (20).

13. The connector seal device as defined in claim 12, characterized in that the engagement end of the hollow press-on cone (40) is provided with a support flange (42), which is adapted to the support collar (32) of the second elastomer insert (30).

14. The connector seal device as defined in claim 12 or 13, characterized in that the pipe union (50) is provided with a pipe extension (51) which fits against a ring-shaped seal (52) on the second elastomer insert or against the hollow press-on cone, so as to form a seal.

15. The connector seal device as defined in claim 12 or 13, characterized in that the pipe union (50) has a pipe extension (51) and/or a separate connecting piece, so that it can form a force-locking connection with the press-on cone (40).

16. The connector seal device as defined in one of the preceding claims, characterized by at least one rope (43) of a sealing material that is capable of swelling.

17. The connector seal device as defined in claim 16, characterized in that the sealing material of the rope (43) swells when it comes in contact with water.

18. The connector seal device as defined in claim 16 or 17, characterized in that the at least one rope (43) of a sealing material capable of swelling is arranged inside a ring-shaped groove (16c, 26c) of a locking ring zone (16, 26).

19. The connector seal device as defined in one of the preceding claims, characterized by at least one sealing element (44) which can be activated by heat.

20. The connector seal device as defined in one of the preceding claims, characterized in that the sealing element (44) comprises a material (45) which increases in volume under the effect of heat.

21. The connector seal device as defined in claim 19 or 20, characterized in that the sealing element (44) is provided with an electric resistance heater (46).

22. The connector seal device as defined in one of the preceding claims, characterized by at least one pressure sensor (49) for detecting the contact pressure on one of the parts (10, 20, 30, 40, 50) of the connector seal device.
23. The connector seal device as defined in claim 22, characterized by several pressure sensors (49) for detecting the contact pressure, wherein these sensors are arranged uniformly spaced apart in circumferential direction of one of the parts (10, 20, 30, 40, 50) of the connector seal device.
24. The connector seal device as defined in claim 22 or 23, characterized in that at least one pressure sensor (49) is arranged on or in one of the parts for the connector seal device, namely the elastomer insert (10, 30), the pipe union (20), or the press-on cone (40).
25. The connector seal device as defined in claim 22 or 23, characterized in that at least one pressure sensor (49) is arranged on or in a ring-shaped seal (52).
26. The connector seal device as defined in one of the preceding claims, characterized by at least one transponder and/or data carrier (59) for detecting, storing, and/or transmitting values measured on one of the parts (10, 20, 30, 40, 50) of the connector seal device.

27. The connector seal device as defined in claim 26, characterized in that at least one transponder and/or data carrier (59) is arranged on or in one of the parts of the connector seal device, namely the elastomer insert (10, 30), the pipe union (20), or the press-on cone (40).

28. The connector seal device as defined in one of the preceding claims, characterized in that it is possible to check by means of pressure sensors (49), transponders and/or data carriers (59) whether a measuring value can be achieved which is necessary for the function of the parts (10, 20, 30, 40, 50) of the connector seal device.